

# PATENT ABSTRACTS OF JAPAN

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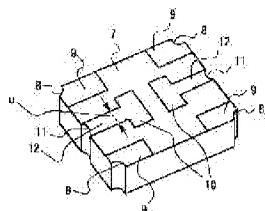
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## (54) OUTER ELECTRODE PATTERN OF ELECTRONIC COMPONENT



### (57)Abstract:

**PROBLEM TO BE SOLVED:** To provide the outer electrode pattern of an electronic component of a structure that in the outer electrode pattern, the generation of a short-circuit between terminal electrodes is absolutely eliminated, a state that the terminal electrode provided on almost the central part of a printed board is soldered to the printed board also can be inspected and moreover, the defect of conduction between the terminal electrodes also can be absolutely eliminated.

**SOLUTION:** The outer electrode pattern of a surface mount electronic component mounted on a printed board is provided with terminal electrodes positioned at the four corners of the bottom of the electronic component and a terminal electrode provided on almost the central part of the bottom and has lead-out electrodes extendedly provided on the ends on the periphery of the bottom on the terminal electrode provided on the central part.

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**CLAIMS**

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[Claim(s)]

[Claim 1]An outer electrode pattern of a surface mounted type electronic component mounted on a printed circuit board characterized by comprising the following.  
A terminal electrode located in four corners of an electronic-parts pars basilaris ossis occipitalis.

An extraction electrode which is provided with a terminal electrode of this pars basilaris ossis occipitalis mostly provided in a center section, and extends in a terminal electrode of said center section in the pars-basilaris-ossis-occipitalis peripheral edge concerned.

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to outer electrode pattern arrangement of the small surface mounted type electronic component which has many especially terminal electrodes about the outer electrode pattern of the surface mounted type electronic component mounted on a printed circuit board.

[0002]

[Description of the Prior Art] In recent years, as for the electronic parts mounted in printed circuit boards, such as communication equipment, for example, a portable telephone etc., the surface mounted type electronic component (below Surface Mount Device; SMD) is widely used from the demand of the reduction in the back. Terminal electrodes, such as ON, an output, and GND, are arranged at the bottoms, such as a ceramic package used for SMD. Drawing 4 is an upper surface perspective diagram of the package in which an example of the foot pattern (terminal arrangement) of said terminal electrode is shown, 1 is a package and 2 is a terminal electrode. however, the number of the terminal electrodes constituted by the package bottom is increasing these days with advanced features of SMD — for example, when six terminal electrodes are required, a foot pattern like drawing 5 is provided.

[0003]

[Problem(s) to be Solved by the Invention] However, since the area at the bottom of a package which provides a terminal electrode by the miniaturization of SMD was small, when the foot pattern of drawing 5 was used, there was a problem which the short circuit between terminal electrodes according [ the gap s between the terminal electrodes 3 and 4 ] to a solder bridge since it is narrow generates. In order to avoid this problem, as shown in drawing 6, forming the two terminal electrodes 5 in a substrate center section was also considered, but there was a problem which cannot perform the inspection (quality decision) of the soldered state of the terminal electrode 5.

[0004] In order to prevent the short circuit between terminal electrodes and to enable the inspection of a soldered state, the foot pattern as shown in drawing 7 is also considered. However, in the foot pattern shown in drawing 7, since the width t of the terminal electrode 6 was too thin, if helicopter-loading-site accuracy to the printed circuit board of SMD was not made high, an SMD package external terminal and the pattern of the printed circuit board were not in agreement, and there was a problem of being easy to produce the defective continuity between both.

[0005] This invention was made in order to solve the conventional problem like \*\*\*\*, and it is \*\*\*\*. The purpose is to be able to make short generating there be nothing between terminal electrodes, and to be also able to inspect the soldered state of a terminal electrode of a substrate mostly provided in the center section, and to provide further the substrate outer electrode pattern which defective continuity can also make there be nothing in the substrate outer electrode pattern of \*\*.

[0006]

[Means for Solving the Problem]The invention of an outer electrode pattern of electronic parts built over this invention in order to solve an aforementioned problem according to claim 1, In an outer electrode pattern of a surface mounted type electronic component mounted on a printed circuit board, it has a terminal electrode located in four corners of an electronic-parts pars basilaris ossis occipitalis, and a terminal electrode of this pars basilaris ossis occipitalis mostly provided in a center section, and is characterized by having an extraction electrode which extends in a terminal electrode of said center section in the pars-basilaris-ossis-occipitalis peripheral edge concerned.

[0007]

[Embodiment of the Invention]Hereafter, based on the illustrated example of an embodiment, this invention is explained in detail. Drawing 1 is a rear-face strabismus general-view figure of SMD provided with the substrate outer electrode pattern concerning this invention, the terminal electrode 9 which was located in the four corners of this rear face 7, and was connected to the castellation (crevice established in the side of SMD) 8, and this rear face 7 — a center section being countered mostly and. It comprises the provided terminal electrode 10 and the extraction electrode 12 connected to the terminal electrode 10 of said center section from the castellation 11 of the peripheral side of a lot where this rear face 7 counters mostly located in the center. The area of the terminal electrode 9 located in the four corners of said rear face 7 and the terminal electrode 10 of the center section of said rear face 7 is almost the same, and the gap between the terminal electrodes 9 and 10 is enough secured so that the short circuit between terminal electrodes by a solder bridge may not arise.

[0008]Drawing 2 is a figure for explaining how to mount SMD which has an embodiment of this invention with a reflow method in the printed circuit board 13 using cream solder. First, as shown in drawing 2 (a), after applying cream solder on 14 s of slash parts of the patterns 14 and 15 wired on the printed circuit board 13, and 15s, as SMD is shown to drawing 2 (b) that the terminal electrodes 9 and 10 on the rear face 7 of SMD counter said slash parts 14s and 15s, it carries.

[0009]After heating the printed circuit board 13 in which said SMD was carried with prescribed temperature in a reflow furnace, via cream solder by cooling, Between 14 s of slash parts of the terminal electrodes 9 and 10 on the rear face 7 of SMD and the pattern wired on the printed circuit board and 15s adheres, and mounting is completed, without the short circuit by a solder bridge occurring.

[0010]Drawing 2 (c) is a strabismus general-view figure showing the state after printed circuit board mounting of SMD. 16 and 17 are the solder fillets formed by soldering. Hereafter, the process in which said solder fillet 17 is formed is explained. At the same time the terminal electrode 10 provided in the center section of the rear face 7 of SMD joins to 15 s of circuit pattern slash parts on a printed circuit board with the cream solder fused in the reflow furnace, Said fused cream solder reaches to the

castellation 11 via the extraction electrode 12 on the rear face 7 of SMD with the character of the interfacial tension of solder, and the fillet 17 is formed by these 11 copies of castellation.

[0011]Therefore, in the inspection of the soldered state of the terminal electrode 10 provided in the center section on the rear face 7 of SMD, an inspection becomes possible by observation of the owner and nothing of the fillet formed in the castellation 11.

[0012]In the coverage of solder, the quantity of the solder used for junction to the terminal electrode 10 and printed circuit board which were especially provided in the center section on the rear face 7 of SMD sets up only the reaching quantity suitably to the castellation 11 via the extraction electrode 12.

[0013]The width  $u$  of this extraction electrode 12 is formed thinly, and since the gap of said extraction electrode 12 and the terminal electrode 9 located in the four corners on the rear face 7 of SMD is secured enough, it is not necessary to explain that there is no problem which the inter-electrode short circuit by a solder bridge generates.

[0014]Drawing 3 (a) and (b) is an upper surface perspective diagram of the outer electrode pattern of the electronic parts in which other embodiments of this invention are shown, Modification is variously possible besides what was shown in above-mentioned drawing 1, and it can apply to electronic parts, such as small size and a surface mount type oscillator which needs many terminal electrodes, and a surface mount type surface acoustic wave apparatus, widely.

[0015]

[Effect of the Invention]Since this invention is constituted as explained above, the invention according to claim 1, In the substrate outer electrode pattern of a small surface mounted type electronic component, since the gap of the terminal electrode located in the four corners of a substrate and the terminal electrode of said substrate mostly provided in the center section is secured enough, the outstanding effect that generating of the inter-electrode short circuit by a solder bridge can be made for there to be nothing is done so.

[0016]Since solder reaches to the peripheral side of a substrate via said extraction electrode by having provided the extraction electrode of one side of the arbitrary peripheral sides of said substrate mostly connected to the terminal electrode of said center section from a center, The outstanding effect that the soldered state after soldering of the terminal electrode of said center section can be inspected is done so.

[0017]The outstanding effect that a flow can be secured enough without causing defective continuity also in the conventional helicopter-loading-site accuracy in carrying to a printed circuit board is done so by having made area of each terminal electrode almost equivalent again.

[0018]Therefore, the outstanding effect of being widely applicable to electronic parts, such as small size and a surface mount type oscillator which needs many terminal

electrodes, and a surface mount type surface acoustic wave apparatus, is done so.

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## **DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1]It is a strabismus general-view figure showing one example of the outer electrode pattern of the electronic parts concerning this invention.

[Drawing 2]The strabismus general-view figure in which it is a figure used in order to explain this invention, and (a) carried the top view of a printed circuit board, and (b) SMD to the printed circuit board, and (c) It is the strabismus general-view figure which carried SMD to the printed circuit board and soldering completed.

[Drawing 3]It is an upper surface perspective diagram showing the embodiment of the substrate outer electrode pattern which requires (a) and (b) for this invention.

[Drawing 4]It is an upper surface perspective diagram showing the conventional substrate outer electrode pattern.

[Drawing 5]It is an upper surface perspective diagram showing the conventional substrate outer electrode pattern.

[Drawing 6]It is an upper surface perspective diagram showing the conventional substrate outer electrode pattern.

[Drawing 7]It is an upper surface perspective diagram showing the conventional substrate outer electrode pattern.

[Description of Notations]

1 Package

2, and 3, 4, 5 and 6 Terminal electrode

7 The rear face of a surface mounted type electronic component (SMD)

8 Castellation (crevice established in the side of electronic parts)

9 and 10 Terminal electrode

- 11 Castellation
- 12 Extraction electrode
- 13 Printed circuit board
- 14, 15 circuit patterns
- 14 s and 15s cream solder application part (slash part)
- 16 and 17 Fillet

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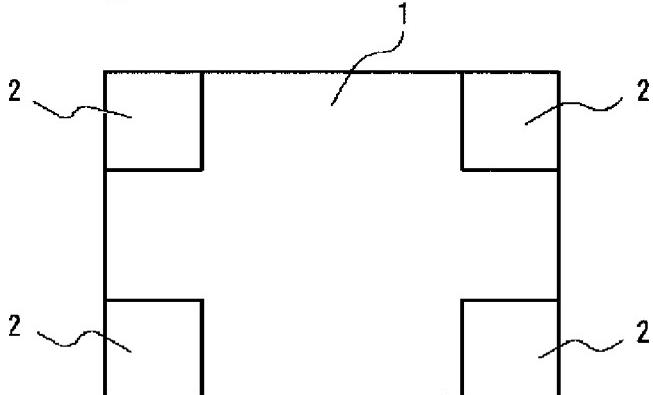
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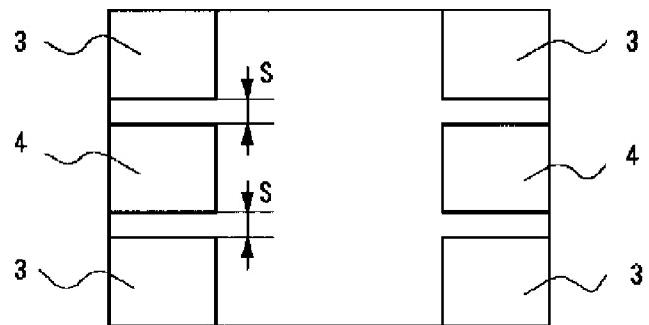
## DRAWINGS

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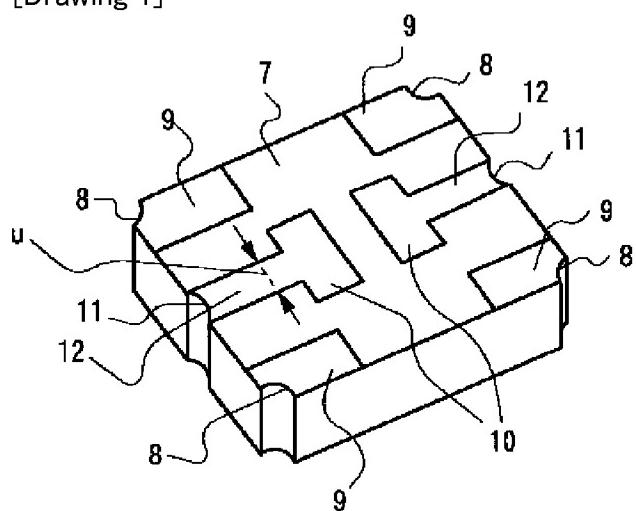
[Drawing 4]



[Drawing 5]

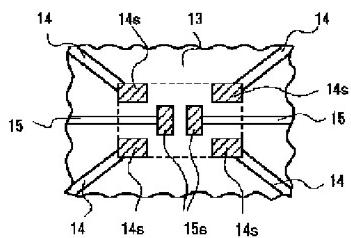


[Drawing 1]

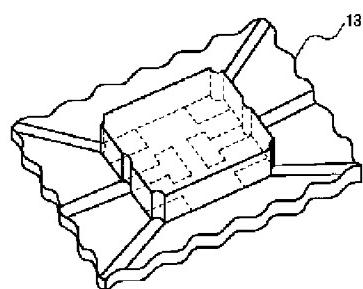


[Drawing 2]

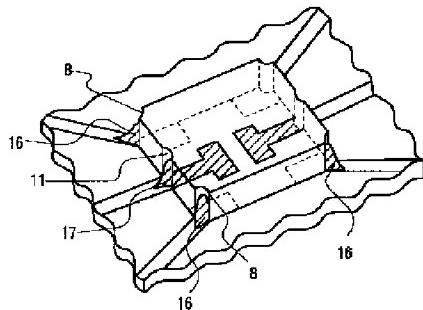
(a)



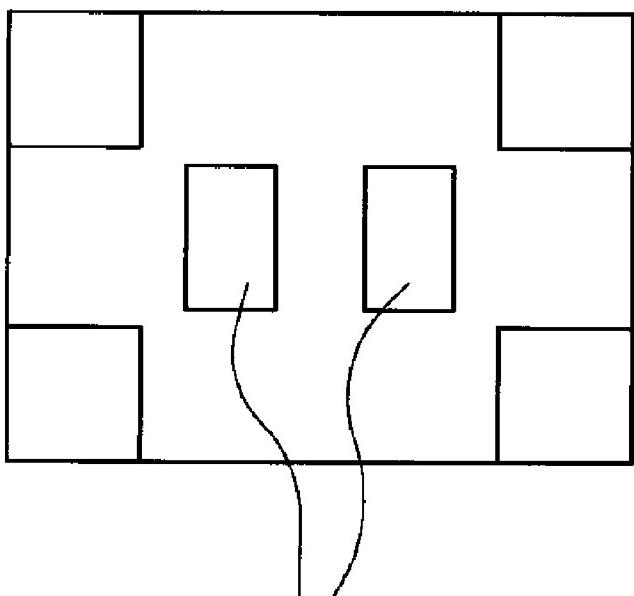
(b)



(c)

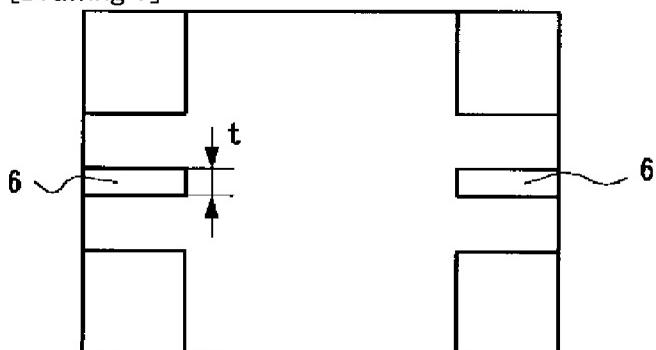


[Drawing 6]



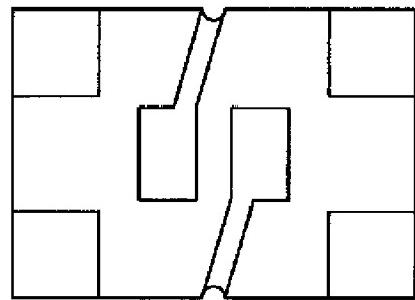
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[Drawing 7]

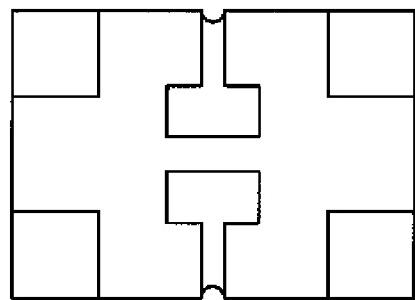


[Drawing 3]

(a)



(b)



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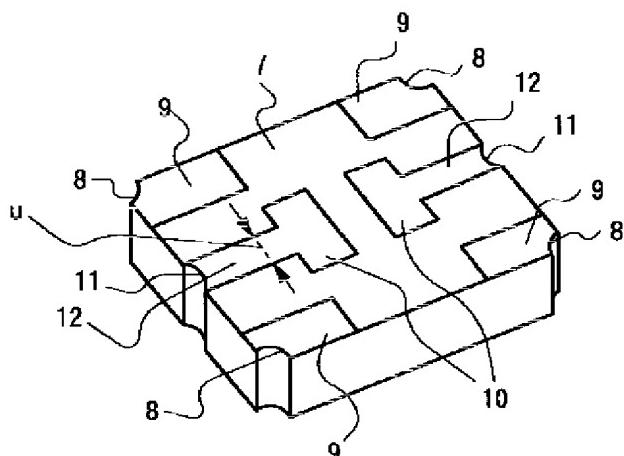
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EE01 GG06 GG12

(54)【発明の名称】 電子部品の外部電極パターン

(57)【要約】

【課題】 電子部品の外部電極パターンにおいて、端子電極間ショートの発生を皆無とし、且つ、基板のほぼ中央部に設けた端子電極の半田付け状態も検査することができ、更に、導通不良も皆無にし得る電極パターンを提供すること。

【解決手段】 プリント基板上に実装する表面実装型電子部品の外部電極パターンにおいて、電子部品底部の四隅に位置する端子電極と、該底部のほぼ中央部に設けた端子電極とを備え、前記中央部の端子電極に当該底部周辺端部に延在する引き出し電極を有する電子部品の外部電極パターン。



## 【特許請求の範囲】

【請求項1】プリント基板上に実装する表面実装型電子部品の外部電極パターンにおいて、電子部品底部の四隅に位置する端子電極と、該底部のほぼ中央部に設けた端子電極とを備え、前記中央部の端子電極に当該底部周辺端部に延在する引き出し電極を有することを特徴とした電子部品の外部電極パターン。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、プリント基板上に実装する表面実装型電子部品の外部電極パターンに関する、特に多数の端子電極を有する小型の表面実装型電子部品の外部電極パターン配置に関する。

## 【0002】

【従来の技術】近年、通信機器、例えば携帯電話機等のプリント回路基板に実装される電子部品は、低背化の要求から表面実装型電子部品(Surface Mount Device:以下、SMD)が広く用いられている。SMDに使用されるセラミックパッケージ等の底面には、入・出力、及びGND等の端子電極が配置されている。図4は、前記端子電極のフットパターン(端子配置)の一例を示すパッケージの上面透視図であって、1はパッケージ、2は端子電極である。しかし、最近、SMDの高機能化に伴って、パッケージ底面に構成される端子電極の数が増加しており、例えば、6個の端子電極が必要な場合には、図5のようなフットパターンを設けている。

## 【0003】

【発明が解決しようとする課題】しかしながら、SMDの小型化によって端子電極を設けるパッケージ底面の面積が小さくなっているために、図5のフットパターンを用いると、端子電極3、4間の隙間sが狭いため半田ブリッジによる端子電極間ショートが発生する問題があった。この問題を避けるため図6に示すように基板中央部に2つの端子電極5を設けることも考えられるが、端子電極5の半田付け状態の検査(良否判定)ができない問題があった。

【0004】更に、端子電極間ショートを防止し、且つ、半田付け状態の検査を可能とするため図7に示すようなフットパターンも考えられている。しかし、図7に示すフットパターンでは、端子電極6の幅tが細すぎるため、SMDのプリント基板への搭載位置精度を高くしなければ、SMDパッケージ外部端子とプリント基板のパターンとが一致せず両者間の導通不良が生じ易いという問題があった。

【0005】本発明は上述の如き従来の問題を解決するためになされたものであって、SMDの基板外部電極パターンにおいて、端子電極間ショートの発生を皆無とし、且つ、基板のほぼ中央部に設けた端子電極の半田付け状態も検査することができ、更に、導通不良も皆無にし得る基板外部電極パターンを提供することを目的とする。

## 【0006】

【課題を解決するための手段】上記課題を解決するため本発明に係る電子部品の外部電極パターンの請求項1記載の発明は、プリント基板上に実装する表面実装型電子部品の外部電極パターンにおいて、電子部品底部の四隅に位置する端子電極と、該底部のほぼ中央部に設けた端子電極とを備え、前記中央部の端子電極に当該底部周辺端部に延在する引き出し電極を有することを特徴としている。

## 【0007】

【発明の実施の形態】以下、図示した実施の形態例に基づいて本発明を詳細に説明する。図1は本発明に係る基板外部電極パターンを備えたSMDの裏面斜視概観図であって、該裏面7の四隅に位置しキャスタレーション(SDMの側面に設けた凹部)8に接続した端子電極9、該裏面7のほぼ中央部に対向して設けた端子電極10、該裏面7の対向する一組の外周辺のほぼ中央に位置するキャスタレーション11から前記中央部の端子電極10に接続する引き出し電極12とから構成されている。尚、前記裏面7の四隅に位置する端子電極9と前記裏面7の中央部の端子電極10の面積はほぼ同じで、且つ、端子電極9、10間の隙間は半田ブリッジによる端子電極間ショートが生じないように十分確保している。

【0008】図2はリフロー方式により本発明の実施形態を有するSMDをクリーム半田を用いてプリント基板13に実装する方法を説明するための図である。先ず、図2(a)に示す如くプリント基板13上に配線されたパターン14及び15の斜線部14s及び15s上にクリーム半田を塗布した後、前記斜線部14s及び15sにSMD裏面7の端子電極9及び10が対向するようにSMDを図2(b)に示す如く搭載する。

【0009】前記SMDを搭載したプリント基板13をリフロー炉内で所定温度にて加熱した後、冷却することによりクリーム半田を介して、SMD裏面7の端子電極9及び10とプリント基板上に配線されたパターンの斜線部14s及び15s間が固着し、半田ブリッジによるショートが発生することなく実装が完了する。

【0010】図2(c)はSMDのプリント基板実装後の状態を示した斜視概観図である。16、17は、半田付けにより形成された半田フィレットである。以下、前記半田フィレット17が形成される過程について説明する。SMDの裏面7の中央部に設けた端子電極10が、リフロー炉内で溶融したクリーム半田によりプリント基板上の配線パターン斜線部15sと接合すると同時に、前記溶融したクリーム半田は半田の界面張力の性質によりSMD裏面7の引き出し電極12を介してキャスタレーション11まで到達し該キャスタレーション11部でフィレット17が形成される。

【0011】従って、SMD裏面7の中央部に設けた端

子電極10の半田付け状態の検査において、キャスタークション11に形成されるフィレットの有・無の観察により検査が可能となる。

【0012】尚、半田の塗布量において、殊にSMD裏面7の中央部に設けた端子電極10とプリント基板との接合に用いる半田の量は、引き出し電極12を介してキャスタークション11まで到達するだけの量を適宜設定する。

【0013】更に、該引き出し電極12の幅uは細く形成されており、前記引き出し電極12とSMD裏面7の四隅に位置する端子電極9との間隙は十分確保されているため、半田ブリッジによる電極間ショートが発生する問題はないことは説明するまでもない。

【0014】図3(a)及び(b)は本発明の他の実施形態を示す電子部品の外部電極パターンの上面透視図であり、上記図1に示したもの以外にも種々変形が可能であって、小型、且つ、端子電極を多数必要とする表面実装型発振器や表面実装型弾性表面波装置等の電子部品に広く適用できる。

#### 【0015】

【発明の効果】本発明は以上説明した如く構成するので、請求項1記載の発明は、小型の表面実装型電子部品の基板外部電極パターンにおいて、基板の四隅に位置する端子電極と前記基板のほぼ中央部に設けた端子電極との間隙が十分確保されているので半田ブリッジによる電極間ショートの発生を皆無にできるという優れた効果を奏する。

【0016】更に、前記基板の任意の外周辺の一辺のはば中央から前記中央部の端子電極に接続する引き出し電極を設けたことにより、半田が前記引き出し電極を介して基板の外周辺まで到達するため、前記中央部の端子電極の半田付け後の半田付け状態を検査することができるという優れた効果を奏する。

【0017】更にまた、各端子電極の面積をほぼ同等としたことにより、プリント基板へ搭載するにあたり従来の搭載位置精度でも導通不良を来すことなく十分導通を

確保できるという優れた効果を奏する。

【0018】従って、小型、且つ、端子電極を多数必要とする表面実装型発振器や表面実装型弾性表面波装置等の電子部品に広く適用できるという優れた効果を奏する。

#### 【図面の簡単な説明】

【図1】本発明に係る電子部品の外部電極パターンの一実施例を示す斜視概観図である。

【図2】本発明を説明するために用いる図であり、

(a)はプリント基板の平面図、(b)SMDをプリント基板へ搭載した斜視概観図、(c)SMDをプリント基板へ搭載し半田付けが完了した斜視概観図である。

【図3】(a),(b)共に本発明に係る基板外部電極パターンの実施形態を示す上面透視図である。

【図4】従来の基板外部電極パターンを示す上面透視図である。

【図5】従来の基板外部電極パターンを示す上面透視図である。

【図6】従来の基板外部電極パターンを示す上面透視図である。

【図7】従来の基板外部電極パターンを示す上面透視図である。

#### 【符号の説明】

1 パッケージ

2、3、4、5、6 端子電極

7 表面実装型電子部品(SMD)の裏面

8 キャスタークション(電子部品の側面に設けた凹部)

9、10 端子電極

11 キャスタークション

12 引き出し電極

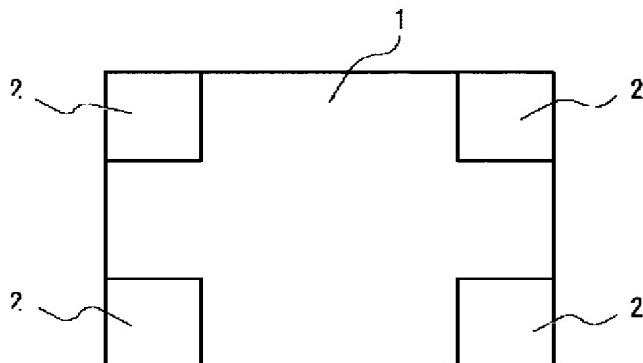
13 プリント基板

14、15 配線パターン

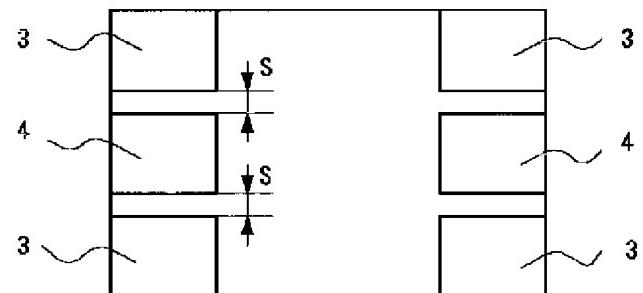
14s、15s クリーム半田塗布部(斜線部)

16、17 フィレット

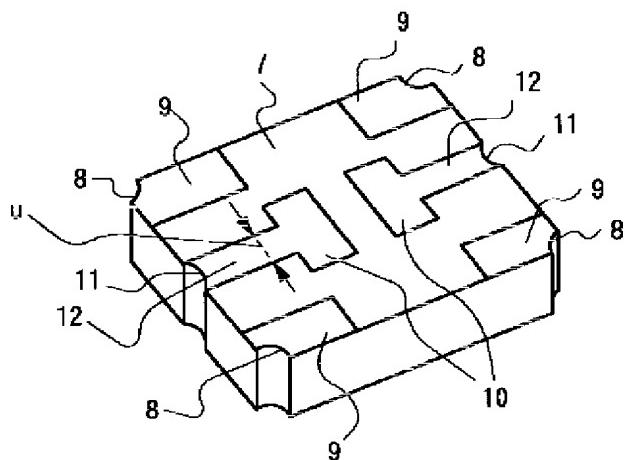
【図4】



【図5】

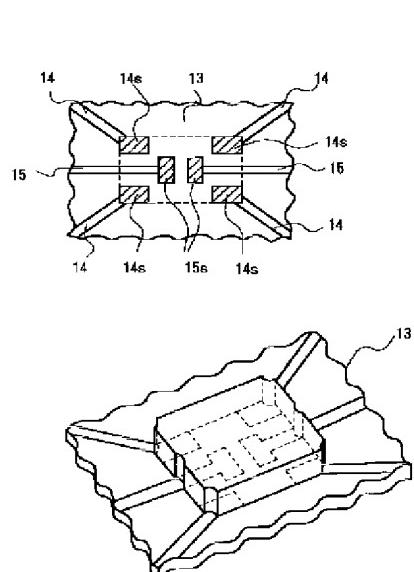


【図1】

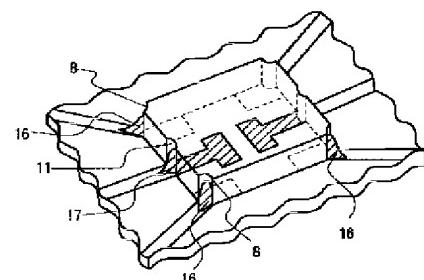


(b)

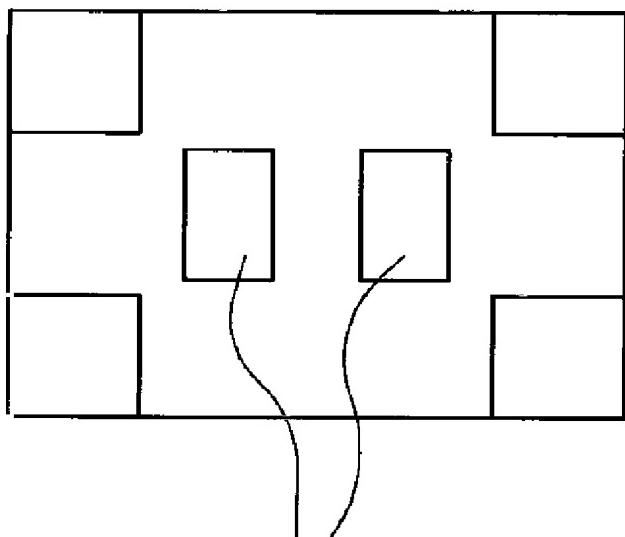
【図2】



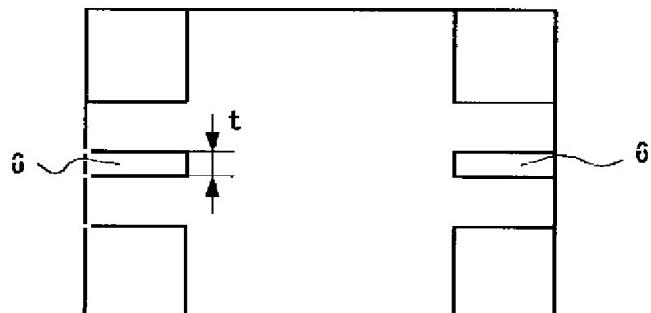
(c)



【図6】



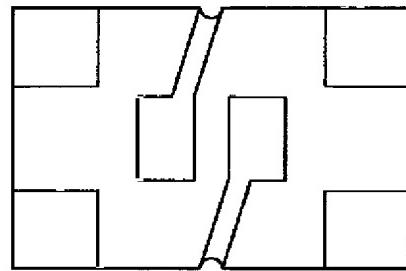
【図7】



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【図3】

(a)



(b)

